SECTION 18 - HYDROGEOLOGIC TESTING

A hydrogeologic report is a detailed geotechnical report assessing groundwater quantity and quality. The hydrogeologic report shall be prepared by a Virginia Certified Professional Geologist or Professional Engineer licensed to practice in Virginia who has demonstrated expertise in hydrogeology.

18-1 Central Water Supplies (Public Wells)

A) Applicability of Hydrogeologic Testing (Amended by Board of Supervisors on September 9, 1999.)

1) The hydrogeologic testing requirements and procedure must be conducted on any new residential subdivision consisting of lots less than one (1) acre in size in all zoning districts. In residential districts and villages, new residential subdivisions which have seven (7) or more lots, regardless of lot size, will require hydrogeological testing. This requirement may be waived by the Planning Commission in accordance with Section 4-27 of this Ordinance on the recommendation of the WSA where a public system is proposed. Where a private water system is proposed, these requirements may be waived on the basis of adequate engineering data demonstrating that the proposed water system will not adversely impact present or future water supplies and that testing is unnecessary or would create an undue hardship.

2) Any commercial or industrial subdivision that will extract more than 10,000 gallons/day.

3) Any proposed development in a service district unless the requirement for hydrogeologic testing is waived by the Planning Commission in accordance with Section 4-27 of this Ordinance on recommendation of the WSA on the basis that testing is unnecessary or would create an undue hardship.

B) Testing Proposal

1) The applicant shall submit a testing proposal to the County. This proposal shall be prepared based on Section 18-1.C, Field Testing.

2) The proposal shall include a map at a scale of not greater than 1:6000 (1"=500') showing the watershed units which are the subject of the hydrogeologic test and report. This map shall include planimetric features, topography, geological contracts, and major structural features. The map shall show proposed well sites, subdivision layout and sources of potential contamination within 1000 feet of any proposed production well(s), to include, but not be limited to, existing or abandoned wells, septic drainfields, underground storage tanks, and houses. The map shall also show springs, watershed boundaries, and groundwater flow. All information is to be gathered from existing records and actual field conditions. Information concerning existing wells and septic drainfields is available from the local Health Department.

3) The proposal shall include a management plan to control the runoff of pumped water and assurances that all adjacent property owners will be notified of the time and duration of field testing.

4) After submission of a proposal for performing a hydrogeologic test, the applicant shall meet with representatives of the Department of Community Development and the WSA to review the proposal. The County or WSA may direct changes in the proposed location of test wells, and other changes as appropriate. This review shall take no more than 30 days from the submission date. No work is to be performed until approvals of proposals are granted in writing by both the County and the WSA.

C) Field Testing for Adequacy of Supply.

1) The production well(s):

a) All wells shall be placed and drilled in accordance with all State, local and WSA ordinances. A Virginia Certified Professional Geologist shall complete drilling lots (SWCB Form GW2) for the production well(s). The geologist shall take at least one rock sample from each geologic formation and shall take samples at no less than twenty (20) foot intervals when in the same geologic formation and upon request shall provide these samples to the WSA.

b) A two (2) hour initial air lift test is to be conducted in order to estimate yield.

c) A drawdown test shall be performed to provide evidence that such a system is capable of furnishing the needs of the full build-out of the proposed development.

1) A standard continuous constant rate draw down test shall be performed on all proposed production wells. If more than one production well is proposed to be in operation at the same time, simultaneous draw-down tests shall be performed.

2) The duration of the drawdown test shall be not less than forty-eight (48) hours with a minimum of twelve (12) hours at steady-state conditions.

a) Steady-state conditions are defined as a static pumping water level that varies by 0.5% at a pumping rate that varies by 3%.

3) The pumping rate shall be such that the static pumping water level does not come within ten (10) feet of any fracture zone that produces more than or equal to 25% of the well's total capacity.

d) Minimum Well Yields

1) Within any existing service district, yields must be greater than 50 gallons per minute in order for the well to be accepted as a public water supply well.

2) Outside of any existing service district, yields must be capable of providing not less than one (1) gallon per minute per each dwelling unit to be connected.

2) The observation wells:

a) A minimum of two (2) observation wells will be drilled with each potential production well. The location of those observation wells shall be proposed by the consulting hydrogeologist and reviewed jointly by the Department of Community Development and the WSA.

b) Where practical, existing wells may be used as observation wells. The consulting hydrogeologist shall provide location, well depth, casing size and depth, static water level, and usage information for any existing well which is proposed to be used as an observation well.

c) Where new observation wells are to be drilled, 2-inch diameter piezometers drilled in hydrogeologically acceptable locations and to appropriate depths may be used.

d) Water levels accurate to 10ths of a foot are to be monitored for drawdown effects continually while the drawdown test is performed.

e) Recovery of water levels in the pumping wells and observation wells shall be recorded until at least 90% recovery is reached. Water levels shall be measured with the following schedule:

ELAPSED TIME	*MEASUREMENT*
1-10 minutes	every minutes
10-100 minutes	every 10 minutes
100-1000 minutes*	every 60 minutes

(*or as long as needed to reach 90% recovery)

D) Laboratory Testing for Water Quality

1) Field testing shall be done at each water bearing zone for the following parameters: Fe, S04, Mn, and hardness. If any values exceed existing State Waterworks Regulations Standards during drilling, the WSA shall be contacted to discuss possible remediation measures.

2) All water supplies shall conform to minimum standards as expressed by the latest divisions of the Waterworks Regulations of the Virginia Department of Health. Final water quality sampling shall be done at the last four (4) hours of the drawdown test and shall consist of one sample per hour.

18-2 Private Individual Wells

A) Applicability of Hydrogeologic Testing (Amended by Board of Supervisors on September 9, 1999.)

1) The hydrogeological testing requirements and procedure for individual wells must be conducted on any new subdivision consisting of seven (7) or more lots less than ten (10) acres in size where individual wells are permitted, unless this requirement is waived in accordance with the provisions of Section 4-27 on the basis of adequate engineering data demonstrating that the proposed water system will not adversely impact present or future water supplies and that testing is unnecessary or would create an undue hardship.

B) Testing Proposal

1) The applicant shall submit a testing proposal to the County. This proposal hall be prepared based on Section 18-2.C., Field Testing.

2) The proposal shall include a map at a scale of not greater than 1:6000 (1"=500') showing the subdivision layout and proposed well sites for each building lot, planimetric features, topography, geological contracts, and major structural features. The map shall show sources of potential contamination within 200 feet of each proposed well site, to include, but not be limited to, existing or abandoned wells, springs, septic drainfields, underground storage tanks, and houses. All information is to be gathered from existing records and actual field conditions. Information concerning existing wells and septic drainfields is available from the local Health Department.

3) The proposal shall include a management plan to control the runoff of pumped water and assurances that all adjacent property owners will be notified of the time and duration of field testing.

4) After submission of a proposal for performing a hydrogeologic test, the applicant shall meet the representatives of the Department of Community Development and the WSA to review the proposal. The County and WSA will review each well location in order to insure that each geologic formation and major land form is tested. The County or WSA may direct changes in the proposed location of test wells, and other changes as appropriate. This review shall take no more than 30 days from the submission date. No work is to be performed until approval of proposals are granted in writing by both the County and the WSA.

C) Field Testing for Adequacy of Supply.

1) The applicant shall drill a minimum of three (3) test wells or 30% of the total number of lots proposed, whichever is greater. Each test well location should be a site approved by the local Health Department.

2) A yield test shall be performed on each text well to provide assurance that the proposed wells will be capable of providing sustained long-term use.

3) Each test well shall be pumped at a constant rate for a minimum of twelve (12) continuous hours.

4) The test well shall be pumped at the rate of the estimated yield determined by the drilling contractor. Well yields must be capable of providing not less than three (3) gallons/minute.

5) The two closest test wells shall be used as observation wells during the pumping test. Water levels in the observation wells shall be measured throughout the entire pumping test for drawdown effects.

6) Recovery of water levels in the pumping wells and observation wells shall be recorded until at least 90% recovery is reached. Water levels shall be measured in accordance with the following schedule:

ELAPSED TIME	*MEASUREMENT*
1-10 minutes	every minute
10-100 minutes	every 10 minutes
100-1000 minutes*	every 60 minutes

(*or as long as needed to reach 90% recovery)

7) The applicant shall submit a drilling log (SWCB Form GW2) for each well.

D) Laboratory Testing for Water Quality

1) Sampling shall be done in accordance with the current revision of the State of Virginia Sewage Handling and Disposal Regulations.

18-3 Submission Requirements

A) Hydrogeologic Report.

1) The report shall contain a graphic lithology of each well and a narrative discussing the geologic setting, watershed units, hydrogeologic units, relief, ccurrence and movement of groundwater, and interpretation of water data from surrounding areas, including groundwater quality.

2) The report shall contain a map or set of maps at a scale of not greater than 1:6000 (1"=500') which shall cover the development proposal. This map shall contain all existing planimetric features, topography with 5' contour intervals, Virginia planar grid coordinates, all proposed roads, proposed lot lines, proposed house sites and proposed septic drainfields, and surface water features, including springs. Flow net (i.e., groundwater contours and direction of groundwater flow) shall be illustrated.

The map shall contain one or more cross-sections, at true horizontal scale and vertical scale (exaggerated as required) which depict at least the following information:

- drill log data
- well site locations
- respective elevations of rock and static water surfaces
- stabilized pump-down levels of the water surface.

The location of each cross-section shall be shown on the plan view map.

3) The report shall develop groundwater mass balance and recharge estimates for the study area. It must include a discussion of the following information, including appropriate supporting calculations and diagrams:

a) Identification of the form and source of recharge.

b) The calculated effect of all lots (wells) pumping at a normal daily consumption rate on the piezometric surface (if applicable).

c) The average recharge for the subdivision, the recharge in drought years, and the average outflow from the subdivision or geologic unit.

d) The net daily water consumption of the subdivision.

e) Proposals addressing what to do with wells of inadequate yield on individual lots (if applicable).

f) The transmissivity of the various materials evaluated by aquifer tests interpreted using professionally-accepted methods.

g) The average storage coefficient of the water-bearing materials.

h) The specific capacity of each well.

i) Table showing Virginia planar grid coordinates for each test well (if he well location is more than two (2) kilometers from any geodetic control monument that is accessible to the public, the coordinate valves may be assumed).

j) Results of the laboratory testing for water quality.

k) For public wells, a recommended operation plan for the well(s) being utilized, to include:

- a recommended "setting depth" for the installation of final production pumps.

- the most desirable pumping rate for each well.

- a time management schedule as to how the well should be pumped over an extended period of time.

18-4 Review

Hydrogeological reports shall be approved jointly by the Department of Community Development (County) and the Water and Sanitation Authority (WSA), except in cases where the WSA will not ultimately operate the proposed water system. In such cases the County shall be the approval authority and the WSA shall make a recommendation on the hydrogeological report to the County.

Four (4) copies of the report shall be submitted to the County for distribution. The County shall retain one copy for public view. The County and WSA shall have fifteen (15) days to review the report in order to determine that the submission and content requirements have been met. Once the report is accepted, written notification shall be sent to the applicant and the report shall be considered officially filed.

The County and WSA shall have sixty (60) days from the filing date to review the technical contents of the report. All written comments from outside parties must be submitted within thirty (30) days of the filing date.